Vaccine-Preventable Diseases in Missouri and the Missouri Immunization Coalition

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Learning objectives

- Review latest issues in vaccine-preventable diseases
- Describe new surveillance capabilities in assessing and analyzing vaccine exemption rates in Missouri
- Introduce the Missouri Immunization Coalition vision, mission and purpose.

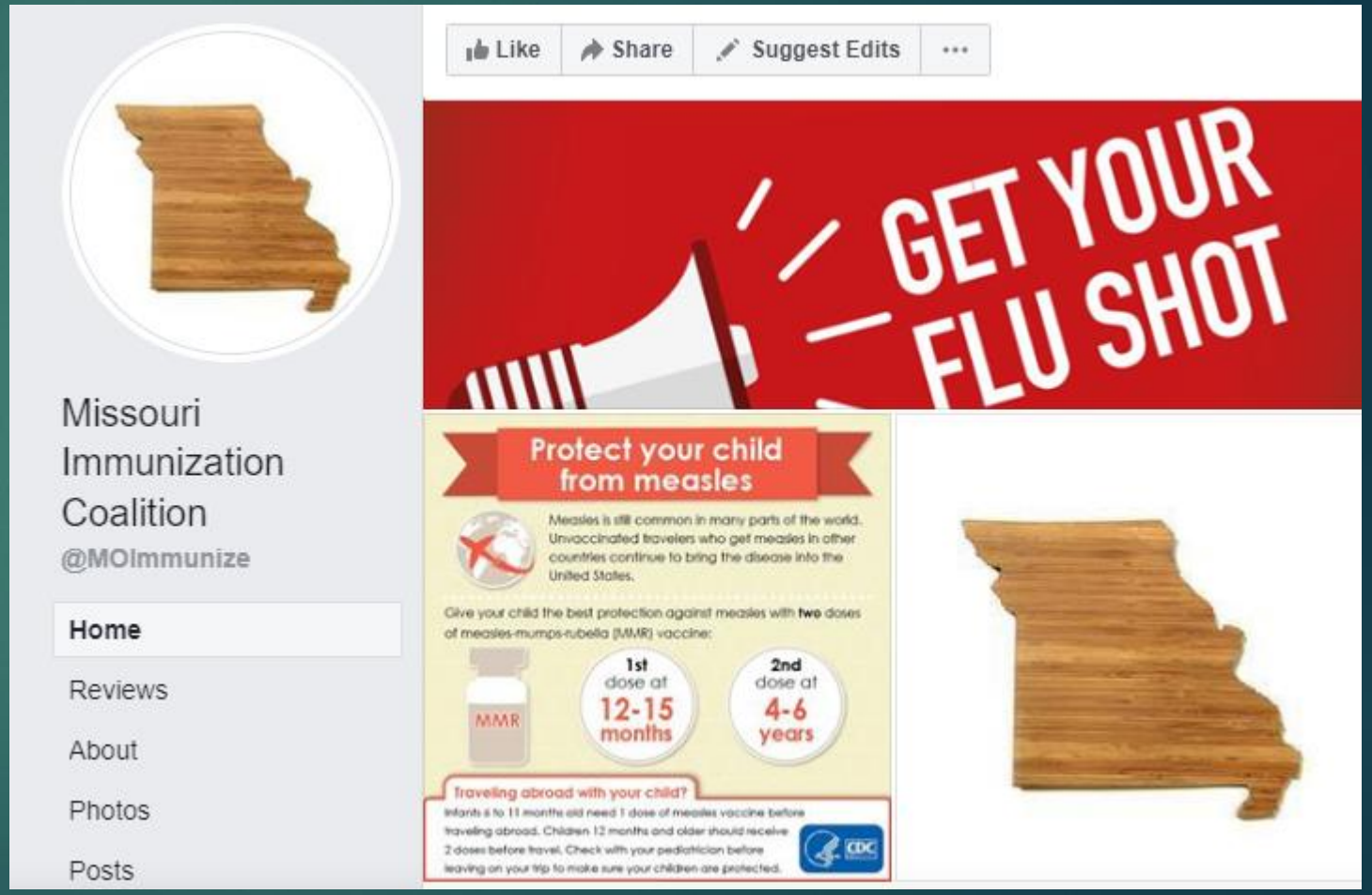


Table 1 Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2020

These recommendations must be read with the notes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars. To determine minimum intervals between doses, see the catch-up schedule (Table 2). School entry and adolescent vaccine age groups are shaded in gray.

Vaccine	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19–23 mos	2–3 yrs	4–6 yrs	7–10 yrs	11–12 yrs	13–15 yrs	16 yrs	17–18 yrs
Hepatitis B (HepB)	1st dose	2nd dose			◄---------- 3rd dose ----------►												
Rotavirus (RV): RV1 (2-dose series), RV5 (3-dose series)			1st dose	2nd dose	See Notes												
Diphtheria, tetanus, acellular pertussis (DTaP <7 yrs)			1st dose	2nd dose	3rd dose			◄----- 4th dose ------►				5th dose					
Haemophilus influenzae type b (Hib)			1st dose	2nd dose	See Notes		◄-- 3rd or 4th dose, See Notes --►										
Pneumococcal conjugate (PCV13)			1st dose	2nd dose	3rd dose		◄----- 4th dose -----►										
Inactivated poliovirus (IPV <18 yrs)			1st dose	2nd dose	◄---------- 3rd dose ----------►							4th dose					
Influenza (IIV)					Annual vaccination 1 or 2 doses								Annual vaccination 1 dose only				
or													or				
Influenza (LAIV)											Annual vaccination 1 or 2 doses		Annual vaccination 1 dose only				
Measles, mumps, rubella (MMR)					See Notes		◄----- 1st dose -----►					2nd dose					
Varicella (VAR)							◄----- 1st dose -----►					2nd dose					
Hepatitis A (HepA)					See Notes		2-dose series, See Notes										
Tetanus, diphtheria, acellular pertussis (Tdap ≥7 yrs)														Tdap			
Human papillomavirus (HPV)													*	See Notes			
Meningococcal (MenACWY-D ≥9 mos, MenACWY-CRM ≥2 mos)			See Notes											1st dose		2nd dose	
Meningococcal B													See Notes				
Pneumococcal polysaccharide (PPSV23)											See Notes						

Range of recommended ages for all children

Range of recommended ages for catch-up immunization

Range of recommended ages for certain high-risk groups

Recommended based on shared clinical decision-making or *can be used in this age group

No recommendation/ not applicable

Table 1 Recommended Adult Immunization Schedule by Age Group, United States, 2020

Vaccine	19–26 years	27–49 years	50–64 years	≥65 years
Influenza inactivated (IIV) or **Influenza recombinant** (RIV)	1 dose annually	1 dose annually	1 dose annually	1 dose annually
or				
Influenza live, attenuated (LAIV)	1 dose annually			
Tetanus, diphtheria, pertussis (Tdap or Td)	1 dose Tdap, then Td or Tdap booster every 10 years			
Measles, mumps, rubella (MMR)	1 or 2 doses depending on indication (if born in 1957 or later)			
Varicella (VAR)	2 doses (if born in 1980 or later)		2 doses	
Zoster recombinant (RZV) *(preferred)*			2 doses	2 doses
or			or	or
Zoster live (ZVL)				1 dose
Human papillomavirus (HPV)	2 or 3 doses depending on age at initial vaccination or condition	27 through 45 years		
Pneumococcal conjugate (PCV13)	1 dose			65 years and older
Pneumococcal polysaccharide (PPSV23)	1 or 2 doses depending on indication			1 dose
Hepatitis A (HepA)	2 or 3 doses depending on vaccine			
Hepatitis B (HepB)	2 or 3 doses depending on vaccine			
Meningococcal A, C, W, Y (MenACWY)	1 or 2 doses depending on indication, see notes for booster recommendations			
Meningococcal B (MenB)	2 or 3 doses depending on vaccine and indication, see notes for booster recommendations			
	19 through 23 years			
***Haemophilus influenzae* type b** (Hib)	1 or 3 doses depending on indication			

Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection

Recommended vaccination for adults with an additional risk factor or another indication

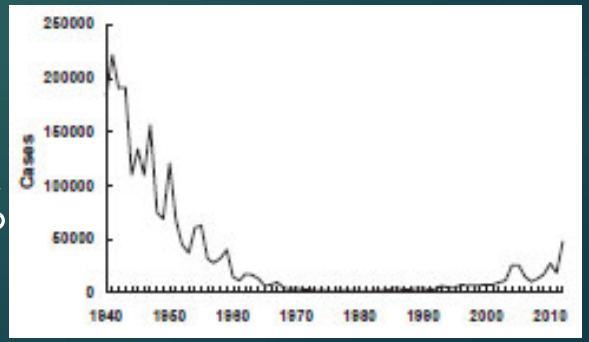
Recommended vaccination based on shared clinical decision-making

No recommendation/ Not applicable

Vaccines Required for School Attendance	Dose Required by Grade												
	K	1	2	3	4	5	6	7	8	9	10	11	12
DTaP/DTP/DT[1]	4+	4+	4+	4+	4+	4+	4+	4+	4+	4+	4+	4+	4+
Tdap[2]									1	1	1	1	1
MCV[3] (Meningococcal Conjugate)									1	1	1	1	2
IPV (Polio)[4]	3+	3+	3+	3+	3+	3+	3+	3+	3+	3+	3+	3+	3+
MMR[5]	2	2	2	2	2	2	2	2	2	2	2	2	2
Hepatitis B[6]	3+	3+	3+	3+	3+	3+	3+	3+	3+	3+	3+	3+	3+
Varicella[7]	2	2	2	2	2	2	2	2	2	2	1	1	1

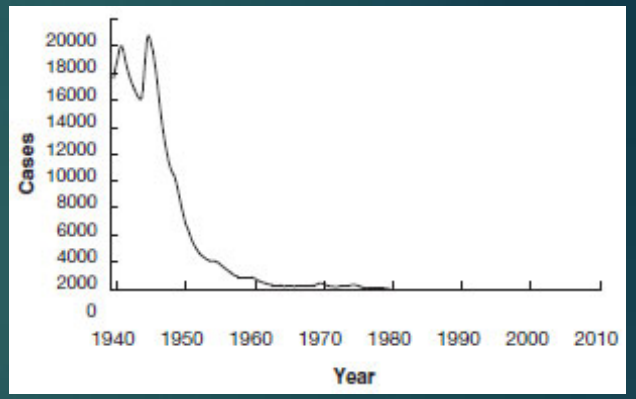
Pertussis

- Whooping Cough
- Runny nose, mild cough for 1-2 weeks
- Severe paroxysms of cough for 1-10 weeks
- Convalescence of weeks to months
- Complications: pneumonia, seizures, encephalopathy, otitis media, anorexia, dehydration, pneumothorax, hernias
- Before immunization available in 1940's: >200,000 cases reported in US
- 2018: 15,609 cases in US; 170 cases reported in Missouri
- 16-18 deaths per year in US; 195,000 deaths worldwide
- US 2018, children with four pertussis immunizations completed 79.8%
- Missouri 2018: 69.3%, lowest percentage of all states in US

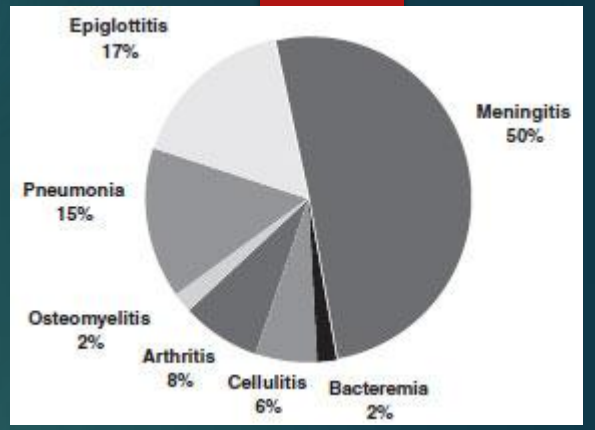


Diphtheria

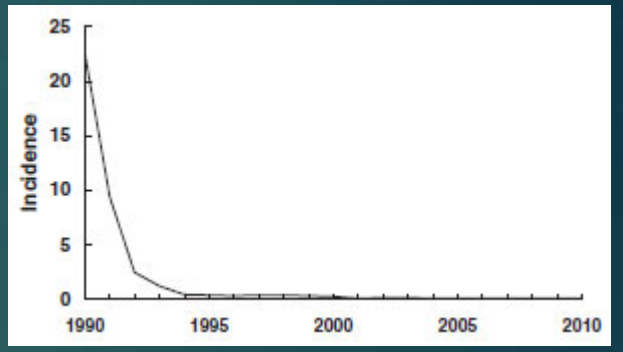
- Sore throat, fever, malaise, membrane on throat
- Complications due to circulating toxin
- Most common complications: myocarditis, neuritis (paralysis)
- Mortality rate 5-10%
- US 1920's: 100,000-200,000 cases per year; 13,000-15,000 deaths
- Gradual decrease in incidence to ~19,000 cases in 1945
- Immunization available in 1940's
- 55 cases in US reported between 1980 and 2011
- Worldwide still concern: 1990-1994 >157,000 cases and >5,000 deaths in countries in the former Soviet Union
- Missouri 2018, lowest percentage of 2 year olds immunized in nation



Haemophylis influenzae type b



- Prior to vaccine in late 1980's, most common cause of serious invasive bacterial infection in children < 5 years of age, 5 in every 1,000 children
- 50% of cases presented as meningitis, 3-6% case fatality
- Epiglottitis, Pneumonia, Cellulitis, Bacteremia, Osteomyelitis
- Rapid drop in annual incidence per 100,000 population after vaccine available
- Early 1980's 20,000 cases per year in US, mostly in kids < 5 years
- 2018: 38 cases in children <5 years due to type b; none in MO
- 2016: US rate of completion of Hib vaccine series by 19 mos: 74.1%
- 2016: MO rate 60.7%, 50th among US states

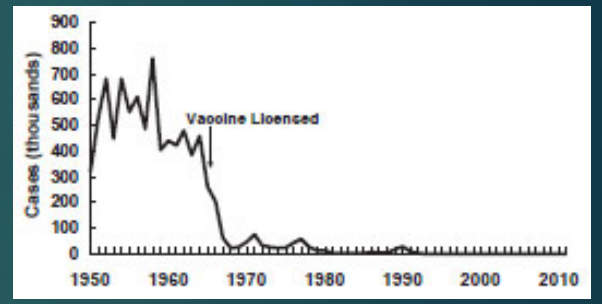


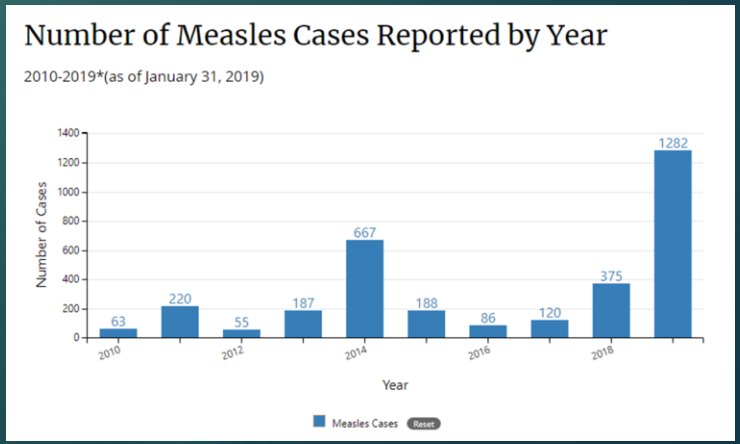
Measles (Rubeola)

- Measles is a global disease; 145,700 deaths worldwide in 2013
- Case fatality rate 0.2% in high income countries, 10% in low
- Before vaccination, virtually universal infection in childhood
- Incubation period of 10-12 days
- Prodrome of conjunctivitis, rhinorrhea, cough, fever
- Koplik's spots 1-2 before rash
- Rash develops 14 days after exposure, lasts 5-6 days
- Virus transmissible from prodrome onset until 3-4 days after rash ap
- Complications include diarrhea and ear infections
- Serious complications include pneumonia and encephalitis

Measles

- Before vaccine introduced in 1963, 500,000 cases and 500 deaths reported per year in US (actually more likely 3-4 million cases per yr)
- Measles declined rapidly after vaccine introduced
- Measles eliminated from Western Hemisphere in 2002
- Since 1997 an average of 200 cases in US per year until recent outbreaks, mostly imported from outside US
- 2016: 85 total cases in US; 68 indigenous, 17 imported
- 2017: 120 total cases; 99 indigenous, 21 imported
- 2018: 375 total cases; 296 indigenous, 79 imported
- 2019: 1285 total cases; 850 indigenous, 435 imported





Measles

- 2019: 89% in unvaccinated individuals
  10% hospitalized
  86% associated with outbreaks in under-immunized, close-knit communities
- 2016 MMR (#1) immunization rate in US at 13 months: 61.6%
- 2016 MMR (#1) rate in MO: 62.8% (middle of the country)

HPV

- Most common sexually transmitted infection in the U.S.
- 79 Million infected individuals in US; 14 million new cases per year
- 50% of new cases each year in patients 15-24 years of age
- First vaccine was licensed in 2006
- Clinical manifestations of HPV infection include:
  - Anogenital warts
  - Recurrent respiratory papillomatosis
  - Cervical cancer precursors (cervical intraepithelial neoplasia)
  - Cancer (cervical, anal, vaginal, vulvar, penile, and some oropharyngeal cancers)
- Missouri has one of the highest rates of HPV-associated cancers in the US at 111.6 per 100,000
- In Missouri, half of all girls and over two thirds of boys have never received even one dose of HPV vaccine

HPV prevents CANCER!

TABLE 1. Average annual number and rate of human papillomavirus (HPV)—associated cancers and estimated percentage and annual number of cancers attributable to HPV, by HPV type, cancer type, and sex — United States,* 2012—2016

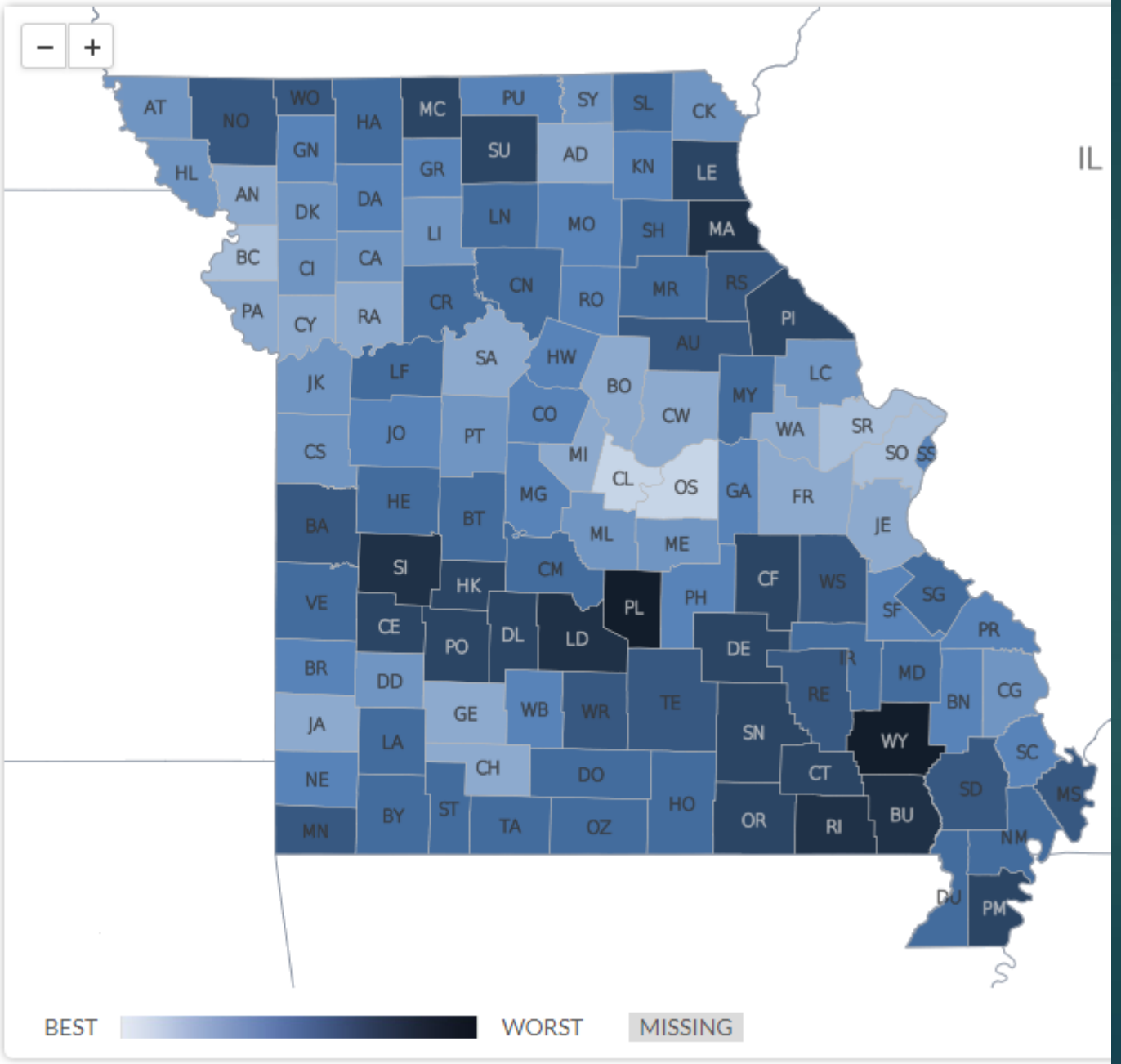
	Reported HPV-associated cancers†		Estimated no.§ (%) of cancers attributable to HPV types¶		
Cancer type	Total no.**	Rate††	9vHPV-targeted	Other HPV	HPV-negative
Cervix	12,015	7.2	9,700 (81)	1,200 (10)	1,100 (9)
Vagina	862	0.4	600 (73)	0 (2)	300 (25)
Vulva	4,009	2.1	2,500 (63)	300 (6)	1,200 (31)
Penis	1,303	0.8	700 (57)	100 (6)	500 (37)
Anus	6,810	1.8	6,000 (88)	200 (3)	600 (9)
Female	4,539	2.3	4,100 (90)	100 (2)	300 (8)
Male	2,270	1.3	1,900 (83)	100 (6)	300 (11)
Oropharynx	19,000	4.9	12,600 (66)	900 (5)	5,500 (29)
Female	3,460	1.7	2,100 (60)	100 (3)	1,300 (37)
Male	15,540	8.5	10,500 (68)	800 (5)	4,200 (28)
Total	**43,999**	**12.2**	**32,100 (73)**	**2,700 (6)**	**9,200 (21)**
Female	**24,886**	**13.7**	**19,000 (76)**	**1,700 (7)**	**4,200 (17)**
Male	**19,113**	**10.6**	**13,100 (69)**	**1,000 (5)**	**5,000 (26)**

Influenza

- Incubation period 2 days (range 1-4 days)
- 50% of infected persons develop classic symptoms
- Abrupt onset of fever (usually 101° - 102° F), myalgia, sore throat, nonproductive cough, headache
- Secondary complications
  - Pneumonia – Secondary bacterial pneumonia or Primary influenza pneumonia
  - Reye syndrome
  - Myocarditis
  - Death reported in <1 per 1,000 cases
- Annual influenza-associated deaths ranged from 12,000 to 56,000 between 2010 and 2014, with an average of 23,607 annual deaths
- Persons 65 years of age and older account for 70% to 85% of deaths
- 2.7 times more deaths during seasons when A(H3N2) viruses were prominent
- 2018-2019 flu season, only 49.2% of US population and 50% of Missouri population immunized

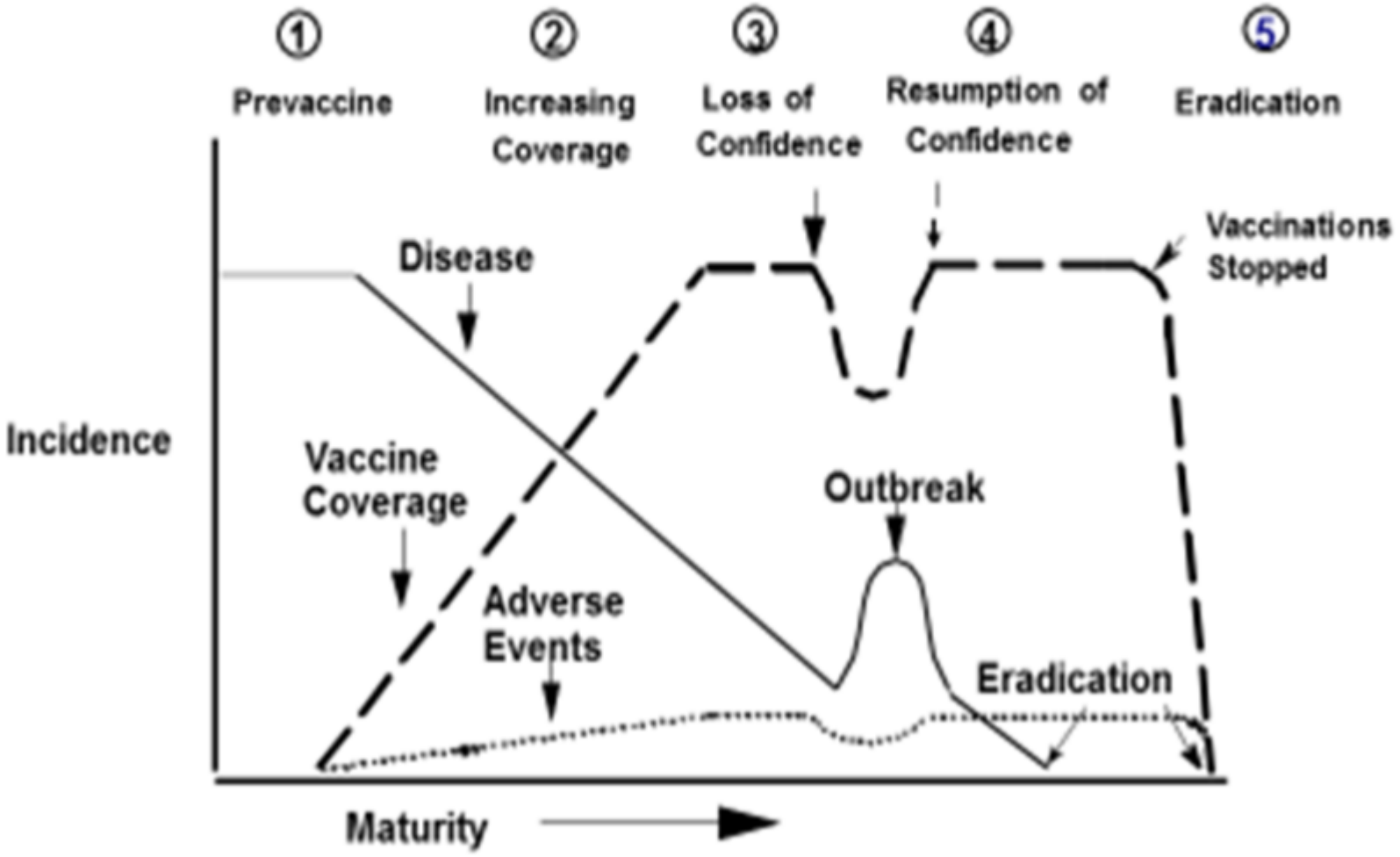
Top U.S. Performers:	52% (90th percentile)
Range in Missouri (Min-Max):	16-56%
Overall in Missouri:	44%
Years of Data Used:	2016

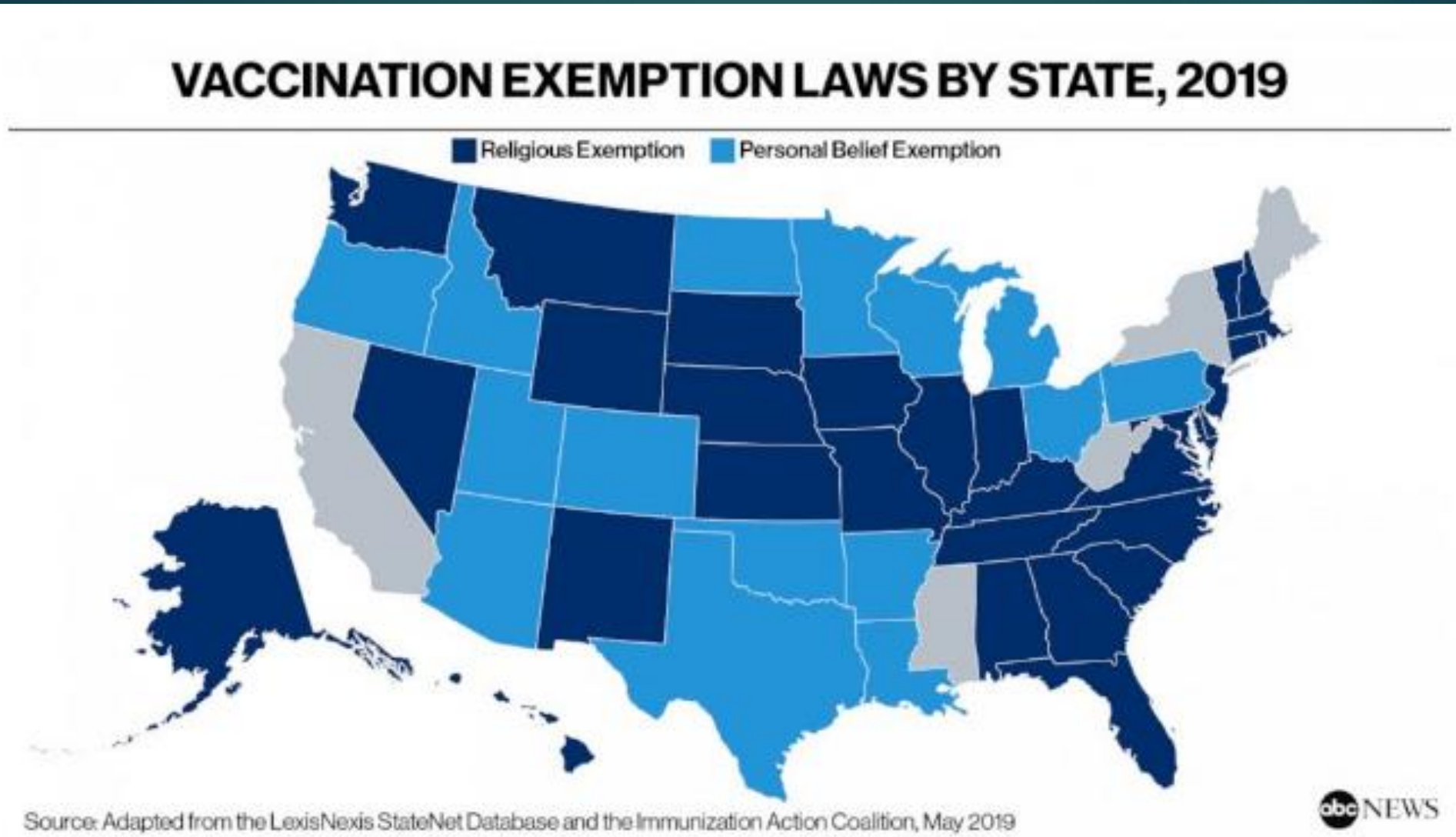
Map | Data | Description | Data Source | Policies



https://www.countyhealthrankings.org/app/missouri/2019/measure/factors/155/map

Evolution of Immunization Program and Prominence of Vaccine Safety



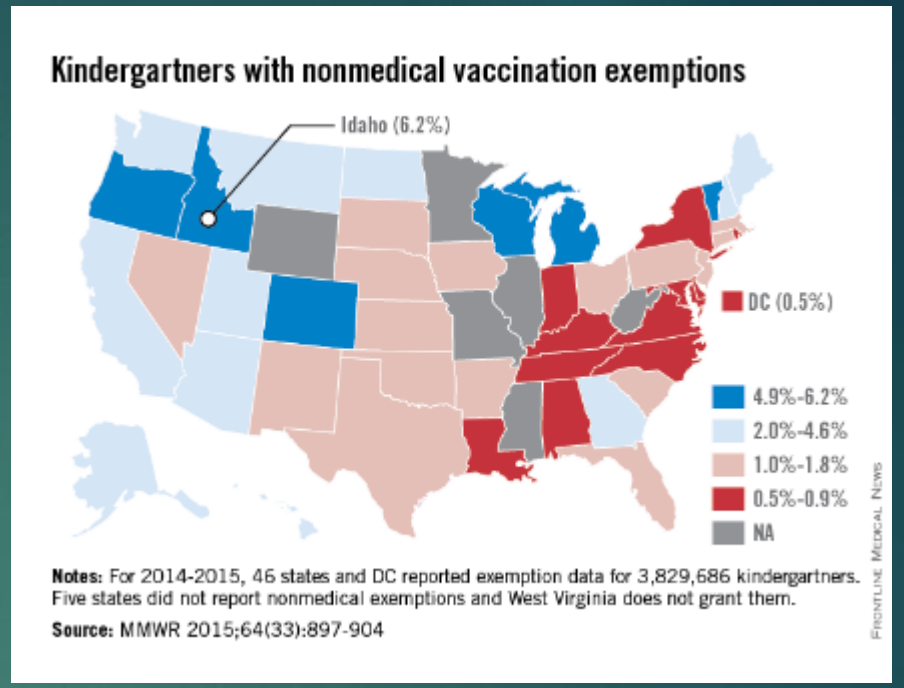


Vaccination Exemption Laws by State, 2019

ABC News Photo Illustration, Adapted from the LexisNexis StateNet Database and the Immunization Action Coalition, May 2019

New partnership!

- DHSS Immunization Program
- MU Extension CARES Program
- MU Department of Public Health
- Region F Academic Health Region
- Missouri Immunization Coalition
- Missouri Public Health Association



GEOGRAPHIC AND TEMPORAL TRENDS IN MISSOURI IMMUNIZATION EXEMPTION RATES

Center for Applied Research and Engagement Systems
University of Missouri Extension

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School of Health Professions
University of Missouri

PROJECT DETAILS & OBJECTIVES

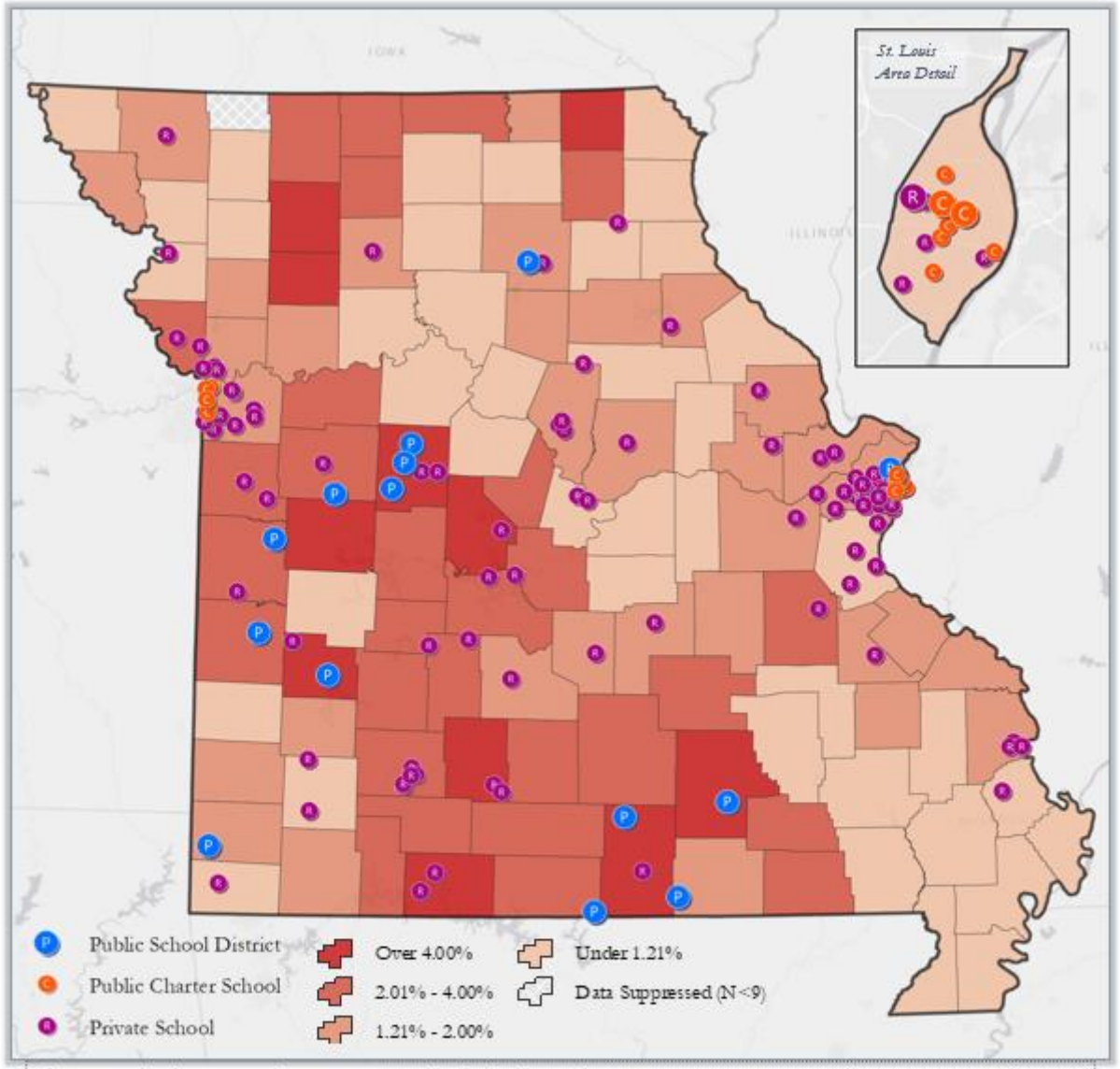
A new partnership between the University of Missouri and the Missouri Department of Health and Human Services (DHSS) aims to:

- Describe **spatial and temporal trends** in vaccine exemptions
- Analyze **characteristics of school districts** (urban/rural; socio-economic status, etc.) for predicting high vaccine exemption rates
- Identify the most **actionable data elements** (number, percentage, %Δ) for immunization surveillance
- Create an accessible platform for communicating immunization data to public health departments and the Missouri public

Data sharing is accomplished through the creation of an immunization report on **All Things Missouri** – a free University of Missouri Extension web platform.

Access to the report will be available in October, 2019 by visiting **www.allthingsmissouri.org**

Spatial Variation in Missouri MMR Exemption Rates, 2016-2018

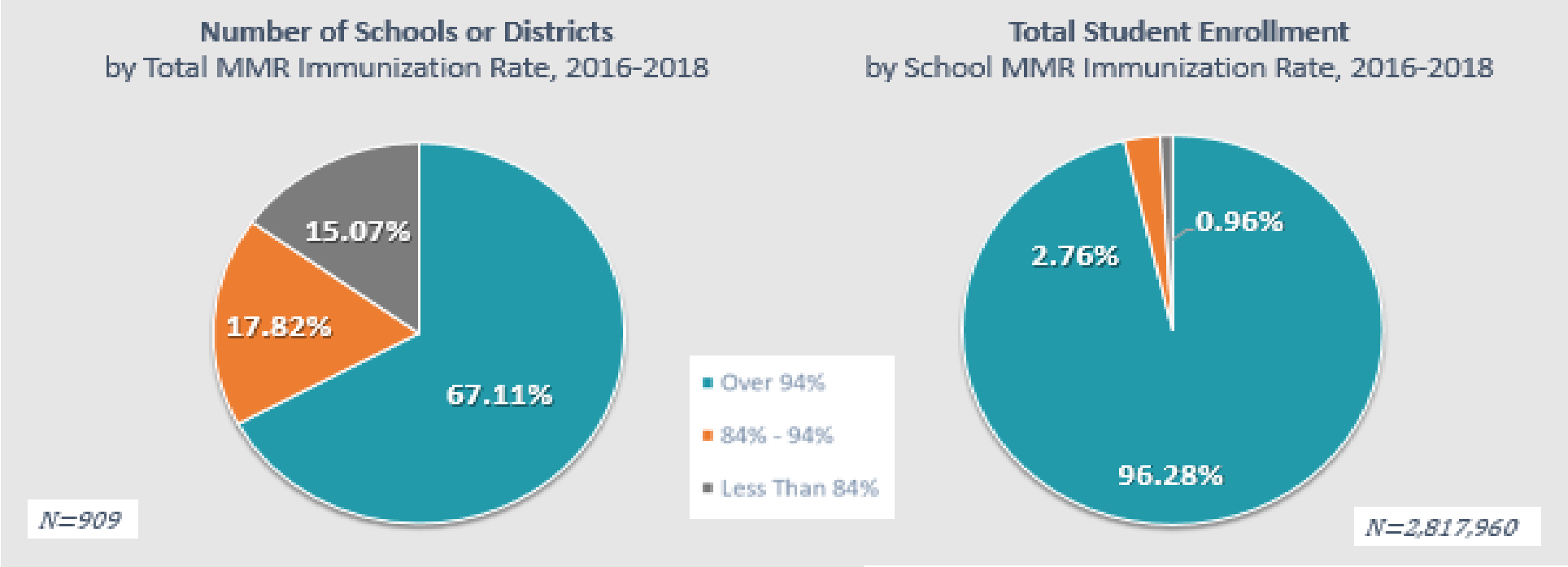


This map displays measles, mumps, and rubella (MMR) vaccine exemption rates by county, as well as public, private, and charter schools where MMR immunization rates are below 94% (full herd immunity).

Mapping the spatial distribution of vaccine exemption rates identified geographic trends of higher exemption rates in Southwest, South Central, and North Central Missouri counties. Central and South East (Boot Heel) counties have lower exemption rates.

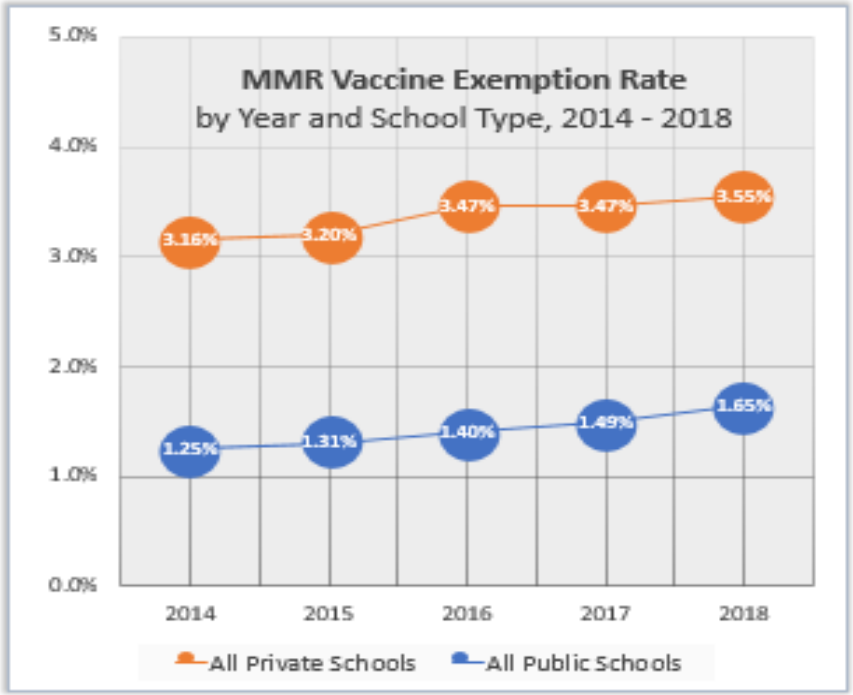
KEY FINDINGS

- Herd immunity – a situation in which a sufficient proportion of a population is immune to an infectious disease (through vaccination and/or prior illness) to make its spread from person to person unlikely[5] - is threatened in a growing number of Missouri schools and school districts, but most at-risk schools have low student enrollment



KEY FINDINGS (cont.)

- Exemption rates for **all** school required VPDs immunizations have **increased significantly** between 2014 and 2018
- **38%** of Missouri counties (n=44) saw statistically significant increases in MMR exemptions
- Private schools are significantly more likely to have high MMR vaccine exemption rates than public schools, though exemptions are increasing across both school types
- Exemption rates are highest among certain religious schools, including Amish (**26%**), Mennonite (**68%**), and Seventh Day Adventist (**6.3%**)



Trends for public and private schools are significant at p<.05

Come Visit!!!

https://allthingsmissouri.org/immunization-report/

Missouri Immunization Report

1. Location | 2. Data Indicators | 3. Reports

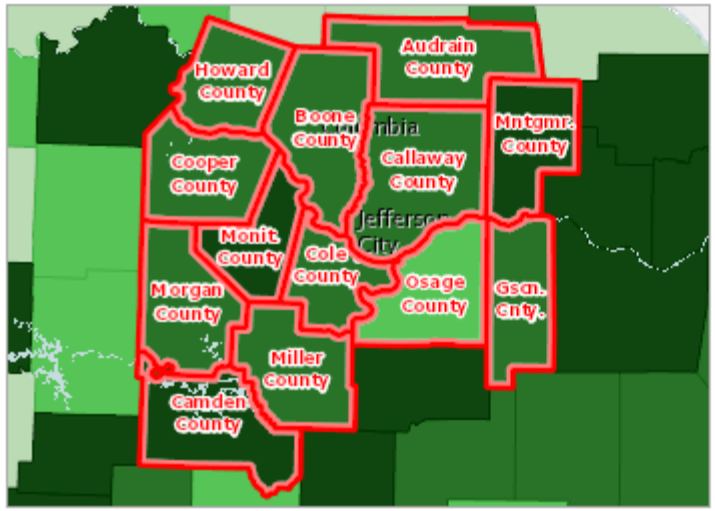
County | Public Health Region | State House Districts | State Senate Districts | US Congressional Districts

County List

Missouri: Select County

Assessment Location

Report Location



Receiving Pneumonia Vaccine, Percent by County, Missouri CLS 2016

- 78.70 - 88.64
- 73.42 - 78.69
- 67.07 - 73.41
- 51.60 - 67.06
- Report Location

MISSOURI IMMUNIZATION COALITION

- Incorporated January 2020
- Mission: Promote immunizations, prevent disease, protect Missouri
- Organizational Purpose: improve the health of Missourians by reducing the spread of vaccine-preventable diseases across the lifespan through immunization education, advocacy, promotion and statewide collaborative partnerships

MISSOURI IMMUNIZATION COALITION

- > Than 100 members
- Coalition includes: physicians, nurses, public health officials, pharmacists, hospitals, hospital systems, health insurance companies, Medicaid insurance carriers, health departments, federally qualified health centers, school systems, Missouri Chapter of the American Academy of Pediatrics, Missouri Academy of Family Physicians, Missouri Section of the American College of Obstetrics and Gynecology, Missouri Nurses Association, Missouri Hospital Association, Missouri Department of Health and Senior Services, Missouri Black Nurses Association, Missouri Pharmacy Association, Missouri Primary Care Association, Missouri School Board Association, Missouri State Medical Association, Missouri School Nurses Association, Missouri State Teachers Association, Parents as Teachers, Mid-America Immunization Coalition,University of Missouri, Saint Louis University, Washington University, AARP, and others

MISSOURI IMMUNIZATION COALITION

- We plan to become the number one source for immunization education (population, professionals, legislature) and advocacy in Missouri
- We plan to work with partners in DHSS, Local Public Health Agencies, MU's Department of Public Health, Extension Service and others to investigate and mitigate against barriers to immunization at the local level.

MISSOURI IMMUNIZATION COALITION

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